

APPLICATION
FOR
UNITED STATES LETTERS PATENT

Title: AUTOMATIC DETERMINATION OF
DIALING METHODS FOR STORED
UNIFORMLY FORMATTED PHONE NUMBERS

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AUTOMATIC DETERMINATION OF DIALING METHODS FOR
STORED UNIFORMLY FORMATTED PHONE NUMBERS

Field of the Invention:

This invention relates generally to telephone dialing sequences and more particularly to an apparatus and method for automatically determining a correct telephone dialing sequence for local, inter-lata, intra-lata, long distance, and international numbers when the source of phone numbers is a uniform dataset that does not specify local dialing requirements.

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Discussion of Related Art:

Dialing sequences, generally speaking, must be accurate to reliably complete phone calls. When a uniformly formatted database of phone numbers is used this can require the user of a "dialing device" (an archaic term that originated with rotary dial instruments but now meant to include push button devices and electronic devices that generate tone or other connections sequences to a telephone system) to provide these formats. Sometimes the format requires that the user manually configure numerous area codes and exchanges.

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With the increasing redistribution of area codes across the country and the addition of new area codes based on demand, dialing methods are continuously changing and the manual redefinition of the dialing methods has become tedious and unreliable. In addition the constant changing of dialing sequences and dialing sequences that are inconsistent across many locales can provide hardship to older users and users with poor eyesight or other handicaps. Some areas require dialing 1 for local long distance others require dialing only a 10 digit number while other local calls may be seven digits.

The inventive algorithm eliminates the need to manually configure the dialing methods for each area code and exchange.

There are products available that can be purchased which are databases that contain the dialing methods for different areas in the country. The inventive method is a significant improvement over the third party database solution since it does not require the use of third party software and information systems which need to be updated periodically and are typically expensive.

SUMMARY OF THE INVENTION

The present invention processes any arbitrary phone number and determines how to dial it so that the call will be

completed regardless of the phone company's dialing requirements. In accordance with the principles of the present invention, a dialing sequence construction is accomplished by a processor in a lookup, assemble, test,
5 record, and analyze cycle to determine the correct dialing sequence for the locality of origination of the phone call. The successful dialing sequence is automatically determined and is compliant with the local telephone company dialing requirements.

10 The inventive algorithm chooses the exact dialing sequence from a known set of sequences. Once a proposed dialing sequence is constructed the number is dialed. The results of the dial are stored in the database table as
15 successes or failures. An unqualified success indicates that the constructed sequence is correct and should be used for all subsequent calls to that area code and exchange.

20 When a dialing attempt fails, as indicated by various telephone company responses the dialing results database table is updated to indicate that the dialing sequence has failed. The failure is stored as an increased count in failures but does not necessarily indicate that the dialing sequence is wrong. A failure is indicated by telephone company responses
25 that indicate that the call cannot be connected, these responses include fast busy, and special information tones.

When the computer system connects, the dialing results database table for the selected dialing method is incremented as successful.

5 In an entirely computer automated system, a positive response from a contact, such as a dual tone multi-frequency (key press) is interpreted as absolute proof that the dialing sequence is correct for the constructed phone number. The dialing results table is then updated to reflect that the
10 successful dialing sequence should be used for subsequent dialing to that area code and exchange.

BRIEF DESCRIPTION OF THE DRAWINGS

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Features and advantages of the present invention will become apparent to those skilled in the art from the following description with reference to the drawings, in which:

20 FIGURE 1 illustrates the formats for common dialing sequences;

FIGURES 2a and 2b illustrate a process block diagram and flow chart representation of the inventive method; and

FIGURE 3 is an illustration of a representative database table that records activities for each area code and exchange pair.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is preferably used with computerized equipment. These inventive methods are designed to determine dialing sequences that allow call completion of calls from any database that contains formatted phone numbers, without requiring any specification of dialing methods for the locality of origination of the dialing.

Referring now to Figure 1, there is shown present day dialing sequences that are used to dial (a) local, (b) local long distance, (c) 10 digit local and long distance dialing, and (d) long distance. This Figure 1 summarizes the present day set of available dialing sequences from which one or more sequence will yield a successful result. Other formats may be used in ones community and additional formats may well be adopted in the future. In the figure, XXX refers to an area code, YYZ refers to an exchange, and ZZZZ refers to the last four digits of a phone number.

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Referring now to Figures 2a and 2b, this is a combination process block diagram and flow chart that illustrates the core

decision processes in the preferred embodiment of the inventive method. A database 10 stores phone numbers for the required contacts. In process 11 the system retrieves the next phone number to contact from the phone number database table 10, it then attempts to retrieve the area code and exchange pair from a dialing results table 25 (that is further described by Figure 3).

The retrieved information, including phone number and dialing history, is passed to decision process 12. Decision process 12 tests whether the area code is a local exchange that was previously entered by the user in system input 26. If the phone number from the phone number database 10 is not a local area code as defined by the user entries in 26, control is passed to process 13 to assemble the dialing sequence as a long distance dialing sequence, process 13 (see Figure 1(d)). If the phone number retrieved from the phone number database 10 does not have an area code, the area code stored in 26 is pre-pended to the phone number before steps 13 or 14 are performed. If the area code of the retrieved phone number from table 10 matches the local area code from user definition 26, control is passed to the local dialing process 14.

Decision process 14 compares the quantity of calling attempts plus the quantity of dialing failures (as retrieved from table 25 area code and exchange key pair record) that were of the format of Figure 1(a) and when the dialing format

history has the fewest attempts plus failures then control will be transferred to process 15.

Otherwise control flow is passed to the decision process 16. Decision process 16 compares the quantity of calling attempts plus the quantity of dialing failures (as retrieved from table 25 area code and exchange key pair record) that were of the format of Figure 1(b) and when the dialing format history has the fewest attempts plus failures then control will be transferred to process 17.

Otherwise control flow is passed to the decision process 18. Decision process 18 compares the quantity of calling attempts plus the quantity of dialing failures (as retrieved from table 25's area code and exchange key pair record) that were of the format of Figure 1(c) and when the dialing format history has the fewest attempts plus failures then control will be transferred to process 19.

Otherwise control flow is passed to process 20, which transfers control to assembly process 21 unless new or international dialing formats are later added.

The inventive algorithm also incorporates the number of potential successes such that decision process 14, 16, or 18 compare the quantity of calling attempts plus the quantity of dialing failures minus the number of potential successes (as

retrieved from table 25 area code and exchange key pair record).

5 The execution of decision processes 14, 16, 18, 20 may be reordered without departing from the true spirit of the invention. Additional decision processes and control flow, such as 14 and assembly process 15, may be added with alternate dialing sequences to allow the algorithm to operate with additional dialing methods without departing from the
10 true spirit of the invention.

Processes 13, 15, 17, 19, 21, and other processes for subsequently added Telephone Company dialing formats, construct a string of characters that are used for connecting
15 through the telephone company to the ultimate destination for the phone call or data delivery. Present day formats are shown in Figures 2a and 2b in processes 13, 15, 17, 19, 21 and in Figure 1(a,b,c,d).

20 Process 22 communicates the constructed connection sequence to the telephone company by "dialing." The dialing process includes initiating and monitoring the progress of the dialing sequences and the telephone company's response to the dialing attempt. The telephone company's response is call
25 progress and is passed to the tracking and identification process 23. The identified telephone company responses are passed to analysis process 24.

The analysis process 24 categorizes the identified responses from the telephone company as presented by process 23 and determines from these identified responses how to store the data into the dialing results table 25. In process 24
5 the dialing results are categorized into potential dialing failures, potential dialing successes, and certain dialing success. Possible failure is a known response from the telephone company that indicates the call, as dialed, could not be connected. Possible successes are dialing results that
10 are not possible failures. Certain success is determined by any response that is determined to be a connect, such as a human response from the dialed phone number.

The analysis process 24 stores the identified and
15 categorized dialing results into table 25 into the appropriate fields as described in Figure 3. Upon determination of certain success field 3 of Figure 3 is set to a value that would indicate to processes 12 which dialing method should be used for future dialing into the presently successful dialed
20 area code and exchange key pair record in dialing results table 25.

Referring now to Figure 3, fields stored in the exemplary dialing results table are as follows:

- Field 1: This field stores the area code for any area code that was encountered
- Field 2: This field stores the exchange for any area code that was encountered
- Field 3: This field indicates the method to use and has special numeric values.
 - o An exemplary value of 9 indicates that the dialing sequence has not yet been determined.
 - o An exemplary value of 1 indicates that a successful connection has been made and that all future dialing to this area code and phone number should use sequence of Figure 1(a).
 - o An exemplary value of 2 indicates that a successful connection has been made and that all future dialing to this area code and phone number should use sequence of Figure 1(b).
 - o An exemplary value of 3 indicates that a successful connection has been made and that all future dialing to this area code and phone number should use sequence of Figure 1(c).

- o An exemplary value of 4 indicates that a successful connection has been made and that all future dialing to this area code and phone number should use sequence of Figure 1(d).

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- Fields 4, 7, 10, 13: These fields are incremented by one on each call attempt that uses the respective dialing method. They are an indication of the number of calls that were attempted using any of the dialing methods of Figure 1(a,b,c,d), respectively.

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- Fields 5, 8, 11, 14: These fields are incremented by one for each dialing failure that occurs using any of the methods shown in Figure 1(a,b,c,d), respectively. They are an indication of the number of calls that had possible failure.

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- Fields 6, 9, 12, 15: These fields are incremented by one for each dialing connection that occurs using any of the methods shown in Figure 1(a,b,c,d) respectively. They are an indication of the number of calls that had possible but not certain success.

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EXEMPLARY USE OF THE INVENTIVE METHOD

An example of the use of the inventive method starts with a calling list of phone numbers collected during customer
5 interviews, sales, or user request to dial. The calling list is stored in ten digit format without regard for the actual method that is required to dial the phone call from any particular location. Changes in a customers account or a simple need to contact the person identified requires dialing
10 per the local phone company's specification. The inventive method enables speedy dialing without knowledge of or concern for local dialing requirements by the phone company. In the presented example when the status of a customer account changes and a message must be delivered to the customer, the
15 inventive method executes within the telephone or telephony equipment to establish a connection to the destination. During each attempt to connect, using the inventive method, monitoring logging takes place and the method determines the correct dialing for subsequent attempts to that area code and
20 exchange.

In summary the inventive method empirically derives appropriate dialing sequences from uniformly stored phone numbers for local, local long distance, ten digit dialing and
25 long distance, then stores the successful results in the dialing results table for speedy dialing of repeated dialing to the same area code and exchange.

While the invention has been described with reference to the exemplary embodiments thereof, those skilled in the art will be able to make various modifications to the described embodiments of the invention without departing from the true spirit and scope of the invention.

Having thus described the invention, what is desired to be protected by Letters Patent is presented in the subsequently appended claims